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| EXAMINER | |
|---|---|
| MALKOWSKI, KENNETH J | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2613 | |

DATE MAILED: 09/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/668,818 | RICE ET AL. | |
| | Examiner | Art Unit | |
| | Kenneth J. Malkowski | 2613 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *22 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the receiver coupled to an opposing end of said large core multimode fiber cable as disclosed in claim 10 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claim 1 is rejected under 35 U.S.C. 102(a) as being anticipated by U.S. Patent Application Publication No. 2002/0105704 to Numata et al.

With respect to claim 1, Numata discloses a system for high speed data transmission (optical transmission system, title) comprising: a large core multimode fiber optic cable (12, Figure 1); a light source for transmitting data (111, Figure 1 (labeled light emission element)); and a lens (112, Figure 2) having a focal length f for receiving light from said light source, said lens being approximately said focal length f from an exposed core of said large core multimode fiber optic cable (Z1, Figure 2)(abstract, vertex of lens 112 and an input plane of the multi-mode fiber) wherein a light signal from said lens is focused on and has a diameter approximately equal to a core diameter of said large core multimode fiber optic cable (Figure 2 light from lens 112 is shown entering the exposed core of multimode fiber optic cable 12 wherein the diameter of the light is approximately equal to the core, give or take a margin of error))(page 4 paragraph (light diameter in relationship to the core diameter can be oriented to control dispersion and transmission distance))(page 4 paragraph 55 (NA s is equal to or less than NA f))to reduce excitation of higher order modes (page 4 paragraph 541 (having a optical signal with a numerical aperture not larger than the numerical aperture of the input plane of the multimode fiber core the higher order modes in the optical signal are decreased, so that the mode dispersion can be reduced)).

With respect to claim 1, Numata discloses the system for high speed data transmission as recited in claim 1 wherein said lens collimates said light signal (Figure 14 (axis of light signal is made parallel to axis of fiber core))(page 1 paragraph 11 (the optical axis is aligned with the fiber axis so that they are on a straight line)) to reduce an excitation of higher order modes generated in said large core multimode fiber optic cable (page 4 paragraph 51 (having a optical signal with a numerical aperture not larger than the numerical aperture of the input plane of the multimode fiber core the higher order modes in the optical signal are decreased, so that the mode dispersion can be reduced))

With respect to claim 3, Numata discloses the system for high-speed data transmission as recited in claim 1 wherein said light source is a diode laser (page 2 paragraph 35 (laser diode)).

With respect to claim 4, Numata discloses the system for high-speed data transmission as recited in claim 1 wherein light source is a light emitting diode (page 2 paragraph 35 (light emitting diode)).

With respect to claim 8, Numata discloses the system for high speed data transmission as recited in claim 1 wherein a cladding layer around said core of said large core multimode fiber optic cable attenuates higher order modes to reduce pulse spreading effects that limit said length/data rate product (page 4 paragraph 51 (the refractive indices of the core 121 and the cladding 122 determines Naf, which reduces higher-order modes thus reducing mode dispersion)).

With respect to claim 10, Numata discloses the system for high speed data transmission as recited in claim 1 further including a receiver coupled to an opposing end of said large core multimode fiber optic cable for receiving said transmitted data (22, Figure 7).

With respect to claims 11 and 16, Numata discloses a method for increasing a length/data rate product for a large core multimode fiber optic cable (applicant states on page 9 paragraph 27 that increasing length/data rate product inherently occurs when higher order modes are attenuated. Numata discloses reducing higher order modes on page 4 paragraph 51) comprising the steps of: providing a data transmission comprising a sequence of light pulses ((111, Figure 21 (light emission element)); collimating light of said data transmission to minimize excitation of higher order modes in the large core multimode fiber optic cable (page 4 paragraph 51 (having a optical signal with a numerical aperture not larger than the numerical aperture of the input plane of the multimode fiber core the higher order modes in the optical signal are decreased, so that the mode dispersion can be reduced)); focusing said light pulses onto an exposed end of a core of the large core multimode fiber optic cable such that a diameter of a light pulse is approximately equal to a core diameter of the large core multimode fiber optic cable (Figure 2 light from lens 112 is shown entering the exposed core of multimode fiber optic cable 12 wherein the diameter of the light is approximately equal to the core, give or take a margin of error))(page 4 paragraph (light diameter in relationship to the core diameter can be oriented to control dispersion and transmission distance))(page 4 paragraph 55 (NA s is equal to or less than NA f)); and attenuating higher order modes of said light pulses as said data transmission propagates down the large core multimode fiber optic cable (page 4 paragraph 51 (the diameter of the entering light and of the core of the fiber effect how the transmission data propagates down the fiber and

therefore attenuation of higher order modes))(Figure 9 depicts the difference between how high and low order modes propagate down a fiber)).

With respect to claim 12, Numata discloses the method for increasing a length/data rate product for a large core multimode fiber optic cable (12, Figure 1) as recited in claim 11 further including using a lens to collimate and focus said light pulses to the large core multimode fiber optic cable (Figure 14 (axis of light signal is made parallel to axis of fiber core))(page 1 paragraph 11 (the optical axis is aligned with the fiber axis so that they are on a straight line)).

With respect to claim 13, Numata discloses the method of increasing a length/data rate product for a large core multimode fiber optic cable as recited in claim 11 further including a step of increasing a signal level of said data transmission to compensate for propagation loss thereby further increasing a transmission distance through the large core multimode fiber optic cable (Figure 4 depicts realizable transmission distance for discernable transmission data and relative optical power))(page 4 paragraph 54 (changing the relative position of the input plane affects transmission distance and data rate of the optical signal))(page 5 paragraph 60 (present invention reduces of mode dispersion based on adjustment of position Z1, thereby increasing the transmission distance)).

With respect to claim 14, Numata discloses the method of increasing a length/data rate product for a large core multimode fiber optic cable as recited in claim 11 further including a step of using a core greater than 50 microns in diameter in the large core multimode fiber optic cable (page 1 paragraph 6 (multi-mode fiber ahs a core diameter of 50 μm to 1 mm)).

With respect to claim 19, Numata discloses the method of increasing a length/data rate product of a large core multimode fiber optic cable as recited in claim 16 further including the steps of: collimating light of said light signals prior to launching said light signals to the large core multimode fiber optic cable (Figure 14 (axis of light signal is made parallel to axis of fiber core))(page 1 paragraph 11 (the optical axis is aligned with the fiber axis so that they are on a straight line)); and focusing light of said light signals to the large core multimode fiber optic cable having a diameter approximately equal to a diameter of a core of the large core multimode fiber optic cable (page 4 paragraph 541 (having a optical signal with a numerical aperture not larger than the numerical aperture of the input plane of the multimode fiber core the higher order modes in the optical signal are decreased, so that the mode dispersion can be reduced))(page 4 paragraph 55 (NA s is equal to or less than NA f)).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 5, 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0105704 to Numata et al.

With respect to claim 5, Numata discloses the system for high-speed data transmission as recited in claim 1, however, Numata fails to specifically disclose wherein said light source provides light having a wavelength greater than 750 nanometers. Despite this, transmitting light at a wavelength greater than 750 nanometers is notoriously well known in the art, is very

commonly used in the majority of light transmission applications and does not constitute a patentably distinct limitation. The motivation for transmitting a wavelength at greater than 750 nanometers is because of its favorable signal loss and dispersive properties.

With respect to claim 6, Numata discloses the system for high-peed data transmission as recited in claim 1, however, Numata fails to specifically disclose wherein said light source transmits data at greater than 10 gigabits per second. Despite this, the ability to transmit data at greater than 10 gigabits per second is standard in fiber optic technology and does not constitute a patentably distinct limitation. The motivation for including a transmitter that can transmit at greater than 10 gigabits per second would be for the obvious advantage of receiving information faster than if data were transmitted at below 10 gigabits per second.

With respect to claim 17, Numata discloses the system for high-peed data transmission as recited in claim 16, however, Numata fails to specifically disclose wherein said light source transmits data at greater than 10 gigabits per second. Despite this, the ability to transmit data at greater than 10 gigabits per second is standard in fiber optic technology and does not constitute a patentably distinct limitation. The motivation for including a transmitter that can transmit at greater than 10 gigabits per second would be for the obvious advantage of receiving information faster than if data were transmitted at below 10 gigabits per second.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0105704 to Numata et al. in view of U.S. Patent No. 6,476,951 to White et al.

With respect to claim 7, Numata discloses the system for high-speed data transmission as recited in claim 1, however, does not specifically mention a launching power. Despite this

transmission power being launched at 20 dBM or greater is well known in the art and does not constitute a patentably distinct limitation. White from the same field of endeavor discloses a signal level from said light source is launched to said large core (abstract (50-62.5 microns)) multimode fiber optic cable (abstract (multimode optical fiber)) at greater than 20 dBM (column 7 lines 10-19 (transmitters are configured to transmit signals at a launch power level up to 20dB greater than required by typical communication protocols)). Therefore, it would have been obvious to one of ordinary skill in the art to transmit at a launch power level of 20 dbM or greater as is taught by White. The motivation for doing so would have been to compensate for high amounts of fiber attenuation (column 6 lines 46-56).

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0105704 to Numata et al. in view of U.S. Patent No. 5,488,506 to Krisvoshlykov et al.

With respect to claim 9, Numata discloses the system for high speed data transmission as recited in claim 8 including a refractive index of both the core and cladding (page 4 paragraph 51 (the refractive indices of the core 121 and the cladding 122)), however, does not specifically disclose the real and imaginary properties of said indices. Krisvoshlykov, from the same field of endeavor discloses a refractive index of said core is substantially real to propagate said light signal with low loss and wherein said refractive index of said cladding layer includes a complex component that attenuates higher order modes generated in said large core multimode fiber optic cable (column 3 lines 27-38 (there is a $\Delta n$ difference between the core an cladding refractive indices, the gradient parameter $\omega$ are complex numbers, the real parts of these numbers describe index guiding properties of the fiber)(column 3 lines 45-53 (imaginary parameter characterizes

the gain guiding properties of the fiber. The gain guiding properties for different modes are different, the lower modes exhibit larger gain than the higher order modes)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the complex component in said cladding as taught by Krisvoshlykov in the fiber optic cable as taught by Numata. The motivation for doing so would have to further reduce higher order mode propagation (column 3 lines 51-53).

8. Claims 15, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0105704 to Numata et al. in view of U.S. Patent No. 6,751,388 to Siegman et al.

With respect to claim 15, Numata discloses the method of increasing a length/data rate product for a large core multimode fiber optic cable as recited in claim 11, however, Numata fails to disclose further including a step of using a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes. Seigman, from the same field of endeavor discloses a step of using a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes (column 1 lines 36-47 (step index exists between the core and cladding regions such that the result is no higher-order modes are able to propagate or be trapped by the fiber))(column 3 lines 47-58 (fiber has a core, cladding and a doping profile distributed between said core and cladding to create a doping profile which defines the gain properties of modes))(column 11 lines 50-54 (well known principles dictate the result of doping the cladding layer)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the doped cladding layer to reduce higher order modes as taught by Seigman in the fiber optic cable as taught by Numata. The motivation for doing so would have

been to reduce the amount of mode mixing and randomization of propagating modes to reduce dispersion (Seigman: column 7 lines 1-15).

With respect to claim 18, Numata discloses the method of increasing a length/data rate product of a large core multimode fiber optic cable as recited in claim 17, however, Numata fails to specifically disclose further including a step of using a step index large core multimode fiber optic cable. Seigman, from the same field of endeavor discloses using a step index in said fiber optic cable (column 4 lines 19-23 (index profile is a step index profile, with the core having a higher index and the cladding having a lower index)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the step index as taught by Seigman in the fiber optic cable as taught by Numata. The motivation for doing so would have been to reduce the amount of mode mixing and randomization of propagating modes to reduce dispersion (Seigman: column 7 lines 1-15).

With respect to claim 20, Numata discloses the method of increasing a length/data rate product for a large core multimode fiber optic cable as recited in claim 19, however, Numata fails to disclose further including a step of using a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes. Seigman, from the same field of endeavor discloses a step of using a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes (column 1 lines 36-47 (step index exists between the core and cladding regions such that the result is no higher-order modes are able to propagate or be trapped by the fiber))(column 3 lines 47-58 (fiber has a core, cladding and a doping profile distributed between said core and cladding to create a doping profile which defines the gain properties of modes))(column 11 lines 50-54 (well known principles dictate the

result of doping the cladding layer)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the doped cladding layer to reduce higher order modes as taught by Seigman in the fiber optic cable as taught by Numata. The motivation for doing so would have been to reduce the amount of mode mixing and randomization of propagating modes to reduce dispersion (Seigman: column 7 lines 1-15).

***Conclusion***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patents are cited to further show the state of the art with respect to multi-tone pilot tone transmission/ identification systems in general:

U.S. Patent Application Publication No. 2004/0258377 is cited to show doped cladding and a step index in a multimode fiber

U.S. Patent Application Publication No. 2003/0218805 is cited to show a collimated lens with a diameter equal to the core diameter

U.S. Patent No. 6,324,326 is cited to show a tapered fiber laser

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth J. Malkowski whose telephone number is (571) 272-5505. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KJM 9/1/06

KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER